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FREQUENCY OF FOMES ANNOSUS SPREAD FROM TRUE FIR STUMPS TO ADJACENT PLANTED PINES

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ABSTRACT

Pine plantations on red fir or high elevation mixed conifer sites in the Sierra Nevada were examined to determine the frequency of spread of Fomes annosus from true fir stumps to adjacent planted pines. Seventy-two percent of the true fir stumps had F. annosus conks. There was no evidence of F. annosus spread from any of the examined stumps to adjacent planted or natural regeneration. Planted pines are at little or no risk from F. annosus-infected true fir stumps from the previous red fir or high elevation mixed conifer stand.

INTRODUCTION

A standard alternative given by Forest Pest Management for annosus root disease management is "species conversion", i.e., in infested true fir stands, the resource manager may convert to pines with little or no risk of subsequent infection. This alternative is based on field observations that annosus root disease is commonly found only on true fir in mixed conifer stands, and on some laboratory evidence for the existence of host specific strains of Fomes annosus. However, actual field data to support the statement that F. annosus in true fir will not move to and infect pines has been lacking, and management implications of planting pines on true fir sites infested with F. annosus needed to be better determined.

The objective of this study was to determine the frequency of spread of F. annosus from true fir stumps to adjacent planted pines in 10- to 20-year-old pine plantations on red fir or high elevation mixed conifer sites in the southern, central, and northern Sierra.

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PROCEDURE

Locations of 10- to 20-year-old pine plantations in the red fir type, or in the high elevation mixed conifer type with a heavy component of true fir, were requested from seven National Forests in the Sierra Nevada. Responses received from five Forests (Sequoia, Sierra, Stanislaus, Eldorado, and Lassen) indicated that about 40 sites were suitable for examination. All the sites were visited in 1984 and 1985 and data taken at 36 plantations (units).

Site information recorded at each location included legal description, elevation, tree species planted, approximate age of plantation, associated vegetation, and adjacent stand type. Stumps were located by systematically traversing the site. The number of stumps actually examined at each site varied with time available and size of plantation, but an attempt was made to examine all stumps with adjacent dead or declining regeneration. Species and diameter of each stump was recorded. Each stump was examined for the presence of F. annosus conks and recorded as infested (conks present) or not infested (no conks). Stumps with probable F. annosus decay, but in which no conks were found, were recorded as not infested.

The condition (dead; declining -- evidence of reduced growth or chlorosis; healthy -- no above ground symptoms of root infection) of adjacent (within 10 foot radius) trees was noted. Information on natural regeneration as well as planted trees was included. Root samples were collected from trees with symptoms of questionable root infection, taken to the laboratory and, after incubation, examined for the presence of the imperfect state of F. annosus.

When available, stumps of pine or incense-cedar were also examined to determine if F. annosus was spreading from them to adjacent planted pines or to adjacent natural true fir or pine regeneration.

RESULTS AND DISCUSSION

Thirty-six plantations on 10 Ranger Districts on 5 Forests were surveyed. Results are summarized in Table 1. A total of 795 true fir stumps were examined. Of these, 576 (72%) had F. annosus conks [374 of 543 (69%) red fir, and 202 of 252 (80%) white fir]. Most stumps had hollows and old decay pockets, indicating that they were infected before falling. Some of the true fir stumps without conks did have decay typical of F. annosus and the number of true fir stumps actually infested may well be higher than data in the table indicate.

Fomes annosus was not found on any of the 1412 trees adjacent to stumps with conks. There was no evidence of F. annosus spreading from true fir stumps to adjacent planted pines or to adjacent natural true fir or pine regeneration. The 25 Jeffrey pine trees recorded as dead or declining were either downslope in frost pockets with snow damage, or had snow damage in combination with heavy brush competition or mechanical damage from gopher activity. The majority of the snow-damaged Jeffrey pines were located in the high elevation Iron Mountain plantations on the Bass Lake Ranger District. Nine of the 20 dead Jeffrey pines had signs of Armillaria root disease.

A limited number (89) of pine and incense-cedar stumps were encountered in the plantations surveyed. Only twelve percent [4 of 51 (8%) sugar pine; 7 of 16 (44%) Jeffrey pine; 0 of 13 (0%) ponderosa pine; 0 of 9 (0%) incense-cedar] had conks of F. annosus. No evidence of spread of F. annosus from these stumps to adjacent planted pines or to natural pine or true fir regeneration was found.

CONCLUSIONS

The statement that F. annosus in true fir will not move to and infect pines apparently applied to all of the plantations examined in this study. Even though F. annosus was commonly associated with true fir stumps, pines planted adjacent to these infested stumps 8 to 24 years previously showed no symptoms of annosus root disease. Pines can apparently survive without infection for at least 24 years next to an infested true fir stump. Although it is unknown if these trees will survive to produce crop trees, there is no evidence that they will not. If pines did become infected, we would expect to see them dying around infested stumps beginning about 5 years after planting. Most pine or true fir mortality observed in the vicinity of infested stumps in natural stands occurs on young seedlings and saplings.

These observations support laboratory evidence for host-specific strains of F. annosus and suggest that a true fir strain will not successfully infect pines. Factors in addition to host specificity may also be involved. These factors include chance of roots of planted trees contacting infected roots, survival or viability of the fungus in small diameter roots of infested stumps, and time needed from infection to produce visible symptoms, may also be involved.

Too few infested pine stumps, and too few situations where natural true fir regeneration occurred in the vicinity of infested true fir stumps, were examined to draw conclusions about spread of F. annosus from pine stumps to pine or to true fir, or from true fir stumps to true fir.

The pine plantations examined did not appear to be threatened by the presence of F. annosus in stumps from the previous stand. Excessive brush competition and snow damage in the high elevation red fir type were more damaging than annosus root disease to pine seedlings.

Table 1. Number and percent of stumps with *Fomes annosus* (Fa) conks and condition of adjacent regeneration in thirty-six plantations in the Sierra Nevada.

Location	Stumps Examined				Trees Adjacent to Infested Stumps				
	Species[z]	Total	With Fa Conks		Species	Healthy	Decline	Dead	Fa
			No.	%					
SEQUOIA NF									
Tule River (10 units)	RF	152	73	48	JP	114	0	0	-
					LP	14	0	0	-
					SP	1	0	0	-
Hume Lake (3 units)	RF	40	27	68	JP	32	0	0	-
SIERRA NF									
Minarets (2 units)	RF	67	54	81	JP	108	0	0	-
Bass Lake (5 units)	RF	182	131	72	JP	306	4	16	0
					SP	7	0	0	-
STANISLAUS NF									
Calaveras (2 units)	RF	20	18	90	JP	38	0	1	0
					RF	3	0	0	-
Mi-Wok (1 unit)	RF	20	17	85	JP	28	1	2	0
					RF	2	0	0	-
Summit (5 units)	RF	18	16	89	JP/PP	38	0	0	-
					WF	1	0	0	-
	WF	82	70	85	JP/PP	159	0	1	0
Pacific (3 units)	RF	38	32	84	JP/PP	91	0	0	-
					RF	4	0	0	-
					SP	10	0	0	-
					LP	1	0	0	-
	WF	58	47	81	JP/PP	125	0	0	-
					RF	7	0	0	-
					SP	7	0	0	-
LASSEN NF									
Hat Creek (1 unit)	WF	42	35	83	PP	119	0	0	-
Almanor (4 units)	WF	70	50	71	JP/PP	149	0	0	-
					LP	4	0	0	-
					WF	2	0	0	-
	RF	6	6	100	JP/PP	17	0	0	-
TOTALS		795	576	72		1387	5	20	0

[z]RF = red fir; WF = white fir; JP = Jeffrey pine; LP = lodgepole pine; SP = sugar pine; PP = ponderosa pine